

Marine GPS Locator

GM-88K

User's Manual

Version A

Please read this manual before operating the unit

May 2007

© ETEK NAVIGATION, INC.

ETEK NAVIGATION, INC.

9F, No.105, Xicheng Rd., Banqiao City,
Taipei County 220, Taiwan (R.O.C.)

TEL: 886-2-26860199 FAX: 886-2-26879500

E-Mail: etek@etek.com.tw

<http://www.etek.com.tw>



Content

| | |
|--|-----------|
| Package Content | 3 |
| Chapter 1 Overview | 4 |
| 1.1 What is GPS? | 4 |
| 1.2 System Requirements..... | 6 |
| Chapter 2 Installing GM-88K..... | 7 |
| 2.1 Interfacing | 7 |
| Chapter 3 Installation & Operating Procedures | 8 |
| 3.1 Installing GPS Utility Analyzer..... | 8 |
| 3.2 Connecting Com Port..... | 9 |
| 3.3 Functional Windows (Interval Setting)..... | 10 |
| 3.4 Functional Windows (Local Time Zone Setting)..... | 11 |
| 3.5 Functional Windows (SBAS Setting) | 12 |
| 3.6 Functional Windows (Power Mode Setting) | 13 |
| 3.7 Functional Windows (Restart Setting)..... | 14 |
| 3.8 Functional Windows (View Default) | 15 |
| Chapter 4 Applications | 16 |
| Chapter 5 Specification | 17 |
| Chapter 6 Troubleshooting | 18 |
| Case 1 | |
| Case 2 | |
| Chapter 7 Limited Warranty | 19 |
| Chapter 8 Available NMEA Messages..... | 20 |
| 8.1 NMEA Protocol..... | 20 |
| 8.2 GGA – GPS Fix Data | 21 |
| 8.3 GLL – Geographic Position – Latitude/Longitude..... | 22 |
| 8.4 GSA – GNSS DOP and Active Satellites | 23 |
| 8.5 GSV – GNSS Satellites in View | 24 |
| 8.6 RMC – Recommended Minimum Specific GNSS Data | 25 |
| 8.7 VTG – Course over Ground and Ground Speed | 26 |
| 8.8 ZDA – Time & Date | 27 |



ETEK NAVIGATION, INC.

PROFESSIONAL IN NAVIGATION & COMMUNICATION

Package Content

- 1. One GM-88K w/15 meter cable**
- 2. User's Manual**
- 3. CD-ROM (Software-GPS Utility Analyzer)**

Please check if all of the contents listed are included and it not damage from shipping if any of the items are missing or damage, please notify **ETEK NAVIGATION, INC.**

<http://www.etek.com.tw>

E-mail: etek@etek.com.tw



Chapter 1 Overview



GM-88K is an outstanding high sensitivity Marine GPS receiver. Its excellent performance easily conquers the most difficult tasks. In addition, it provides various functions to meet customers' needs. You will find the device an **accurate, reliable** and **useful** aid to your positioning pursuits.

GM-88K is the latest GPS product innovation in combining GPS receiver technology and mini-antenna in a Plug-Navigate-Location concept from ETEK NAVIGATION, INC.

GM-88K receives FREE broadcast signals from the Low Orbit Global Positioning System (GPS), a satellite-based transmitter which emits ranging/satellite information/high precision time signals that the **GM-88K** receiver can use to determine positions and time. It also has high sensitivity for weak signal operation without compromising accuracy. Undoubtedly, **GM-88K** is the best choice for you.

Before introducing you our new receiver, we would like to give you some basic background knowledge about GPS, which should be helpful for you to better understand your **GM-88K**.

1.1 What is GPS?

GPS (Global Positioning System) is a satellite-based global navigation system created and operated by the United States Department of Defense (DOD). Originally intended



solely to enhance military defense capabilities, GPS capabilities have expanded to provide highly accurate position and timing information for many civilian applications.

An in-depth study of GPS is required to fully understand how it works, but simply stated: Twenty four satellites in six orbital paths circle the earth twice each day at an inclination angle of approximately 55 degrees to the equator. This constellation of satellites continuously transmits coded positional and timing information at high frequencies in the 1500 Megahertz range. GPS receivers with antennas located in a position to clearly view the satellites pick up these signals and use the coded information to calculate a position in an earth coordinate system. GPS is the navigation system of choice for today and many years to come. While GPS is clearly the most accurate worldwide all-weather navigation system yet developed, it still can exhibit significant errors. GPS receivers determine position by calculating the time it takes for the radio signals transmitted from each satellite to reach earth. It's that old "Distance = Rate x Time" equation. Radio waves travel at the speed of light (Rate). Time is determined using an ingenious code matching technique within the GPS receiver. With time determined, and the fact that the satellite's position is reported in each coded navigation message, by using a little trigonometry the receiver can determine its location on earth.

Position accuracy depends on the receiver's ability to accurately calculate the time it takes for each satellite signal to travel to earth. This is where the problem lies. There are primarily five sources of errors which can affect the receiver's calculation. These errors consist of (1) ionosphere and troposphere delays on the radio signal, (2) signal multi-path, (3) receiver clock biases, (4) orbital errors, also known as ephemeris errors of the satellite's exact location, and (5) the intentional degradation of the satellite signal by the DOD. This intentional degradation of the signal is known as "Selective Availability (SA)" and is intended to prevent adversaries from exploiting highly accurate GPS signals and using them against the United States or its allies. However, on May 1, 2000, U.S. President Bill Clinton ordered Selective Availability (SA) turned off at midnight (Coordinated Universal Time). Now, civilian GPS users around the world will no longer experience the up to 100 meter (approximate 300 feet) random errors that SA added to keep GPS a more powerful tool for the military. Today, GPS units are accurate to within 20 meters (approximately 60 feet); although in good conditions, units should display an error of less than 10 meters. The combination of these errors in conjunction with poor satellite geometry can limit GPS accuracy to 100 meters 95% of the time and up to 300 meters 5% of the time. Fortunately, many of these errors can be reduced or eliminated through a technique known as "Differential."



ETEK NAVIGATION, INC.

PROFESSIONAL IN NAVIGATION & COMMUNICATION

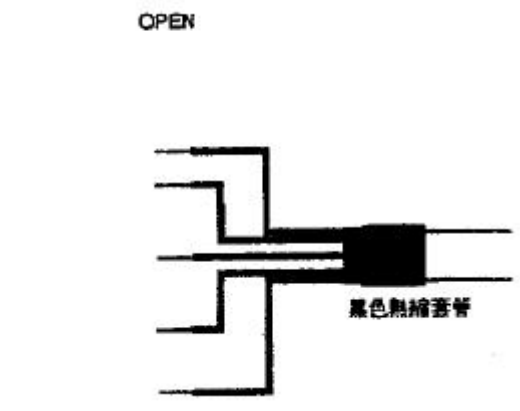
1.2 System Requirements

System requirements for operating your new **GM-88K** GPS Locator are as follows:

- PC running Windows OS or any OS that is compatible with GPS NMEA data format. PDA, Palm-PC, Chart Plotter, Notebook or Micro-controller using UART as serial bus.
- Power source using DC 12V from car or boat.
- Un-obstructed view of the SKY for the satellites over the sky can be seen by the device.

Chapter 2 Installing GM-88K

2.1 Interfacing



GM-88K Open Cable

I/O PIN ASSUGNMENT

| I/O PIN & CABLE | | |
|----------------------------|-----------------|--|
| Wire | Function | Description |
| Green | Rx(RS-232) | To receive external command from PC(Rx) |
| Orange | Tx(RS-232) | Outputs NMEA0183 sentences(Tx) |
| Braid | Earth | To be connected to vehicleassis for EMI suppression if necessary |
| Black | Power- | Power ground (Negative) |
| Red | Power+ | Power input 8 to 35 V DC (Positive) |



ETEK NAVIGATION, INC.

PROFESSIONAL IN NAVIGATION & COMMUNICATION

Chapter 3 Installation & Operating Procedures

With a complete familiarity of your new GPS Locator after referring to Figure 1 & Figure 2, you are now supposed to be ready to connect the unit to your computing device.

PLEASE MAKE SURE THAT THE POWER IS OFF BEFORE PROCEEDING.

3.1 Installing GPS Utility Analyzer

GM-88K is shipped with a CD that stores an application program **GPS Utility Analyzer**. To install this program, please follow the steps stated in next pages.

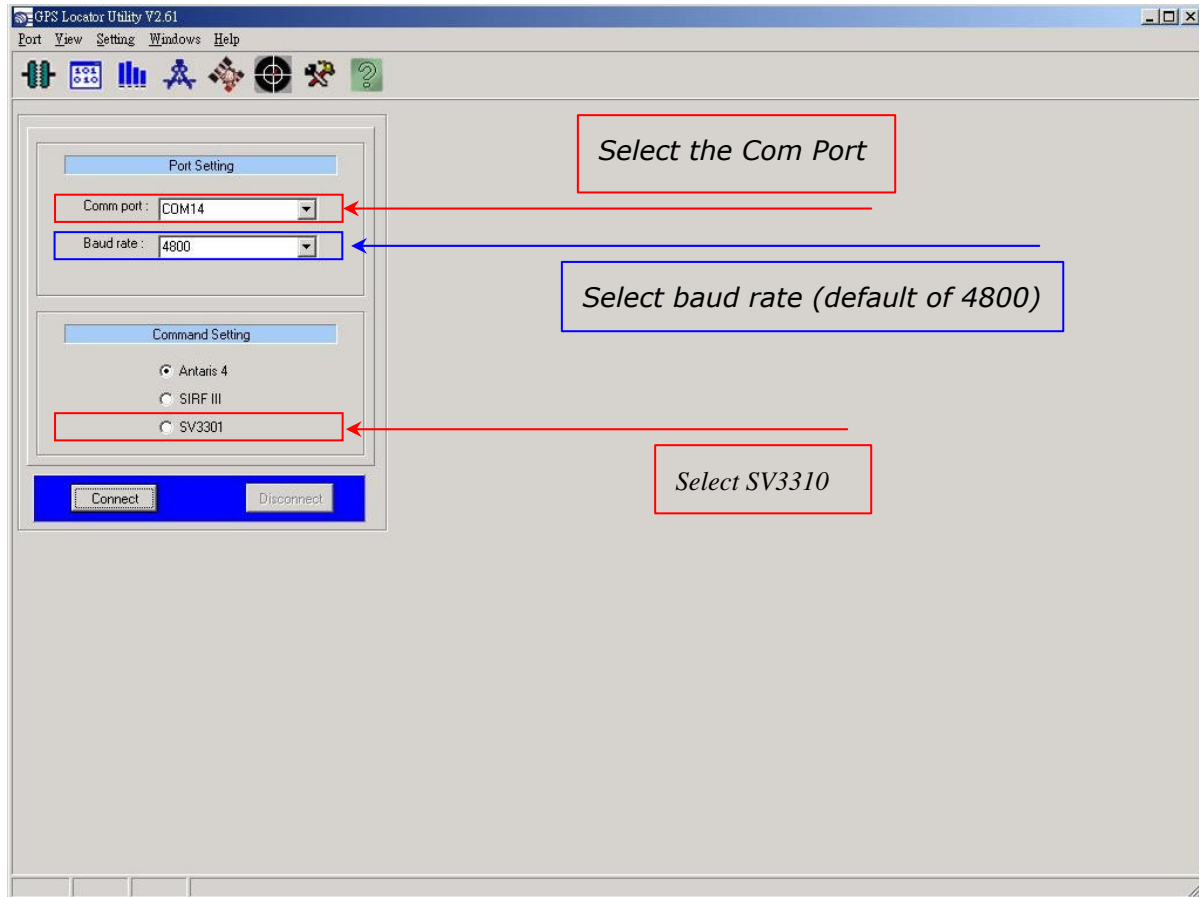
GPS Utility V2.61 is the latest utility for configuring the GPS settings of ETEK GPS receivers. You can find the utility in the CD and the password is in License.txt. Double click on the Setup.exe and follow the installation procedures.

GPS Utility (Version 2.61), an application program for **GM-88K**, enables you to do the configurations on the receiver. Below are instructions of how to work with this software, with assumption that you have successfully installed **GPS Utility**



3.2 Connecting Com Port

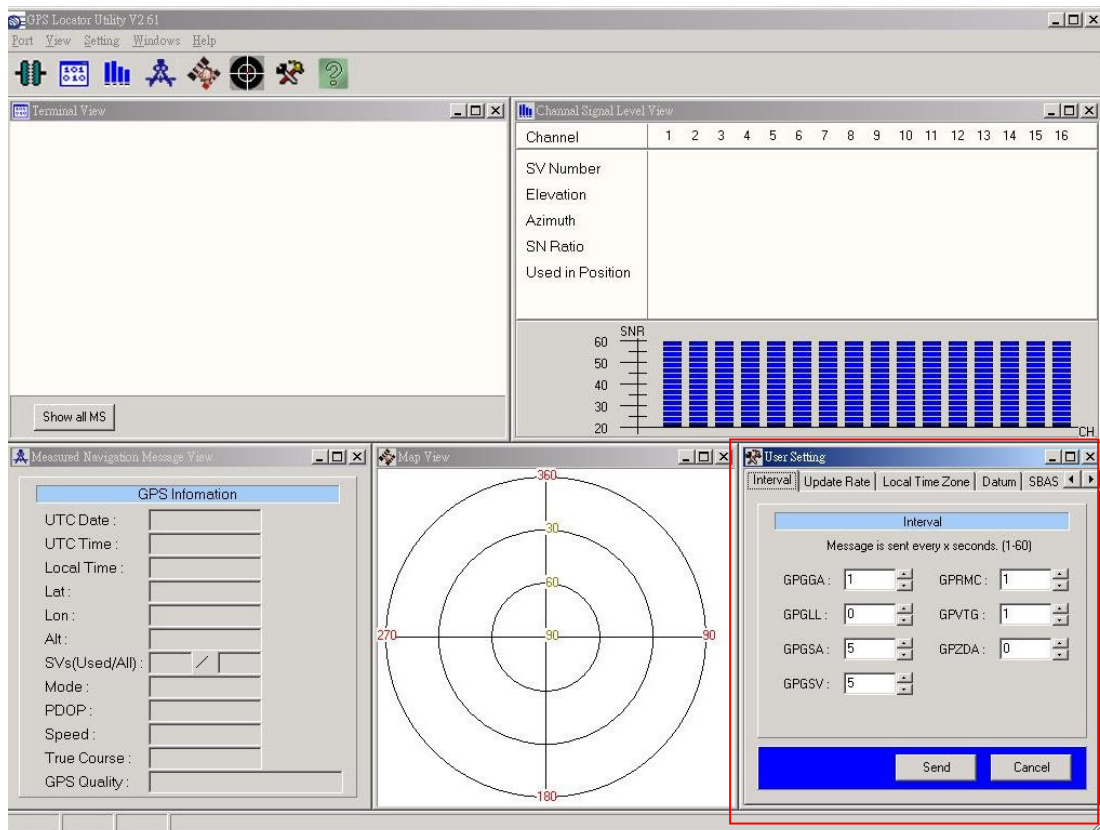
After selecting the Com Port, baud rate and Command Setting, click on **"Connect"** and you will be able to do the configurations.





3.3 Functional Windows (Interval Setting)

After connecting with success, you can view the NMEA data from different functional windows. The configurations can be done in the “**User Setting**” window. On top of the “User Setting” window, there are several taps. Please select the taps for different settings.



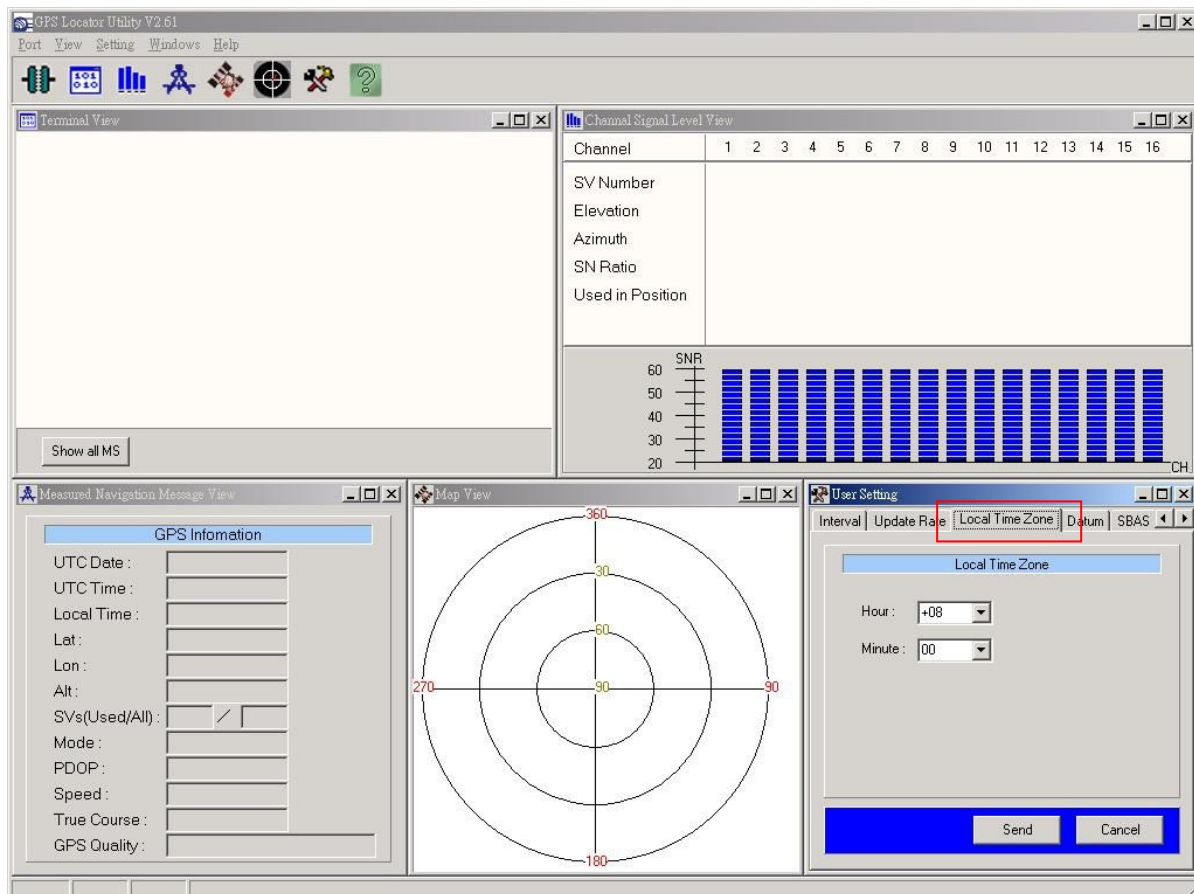
User Setting Window, change GPS sentence output interval

Note: After finishing interval setting, click “Send” to confirm the setting before proceeding next tap window for the other setting.

Note: After finishing all the setting(s), please tap to “Save to Flash” window. Tick “Save to Flash” and click on “Send” if the user would like to save the customized setting(s) into flash.

3.4 Functional Windows (Local Time Zone Setting)

Different local time zones are available.



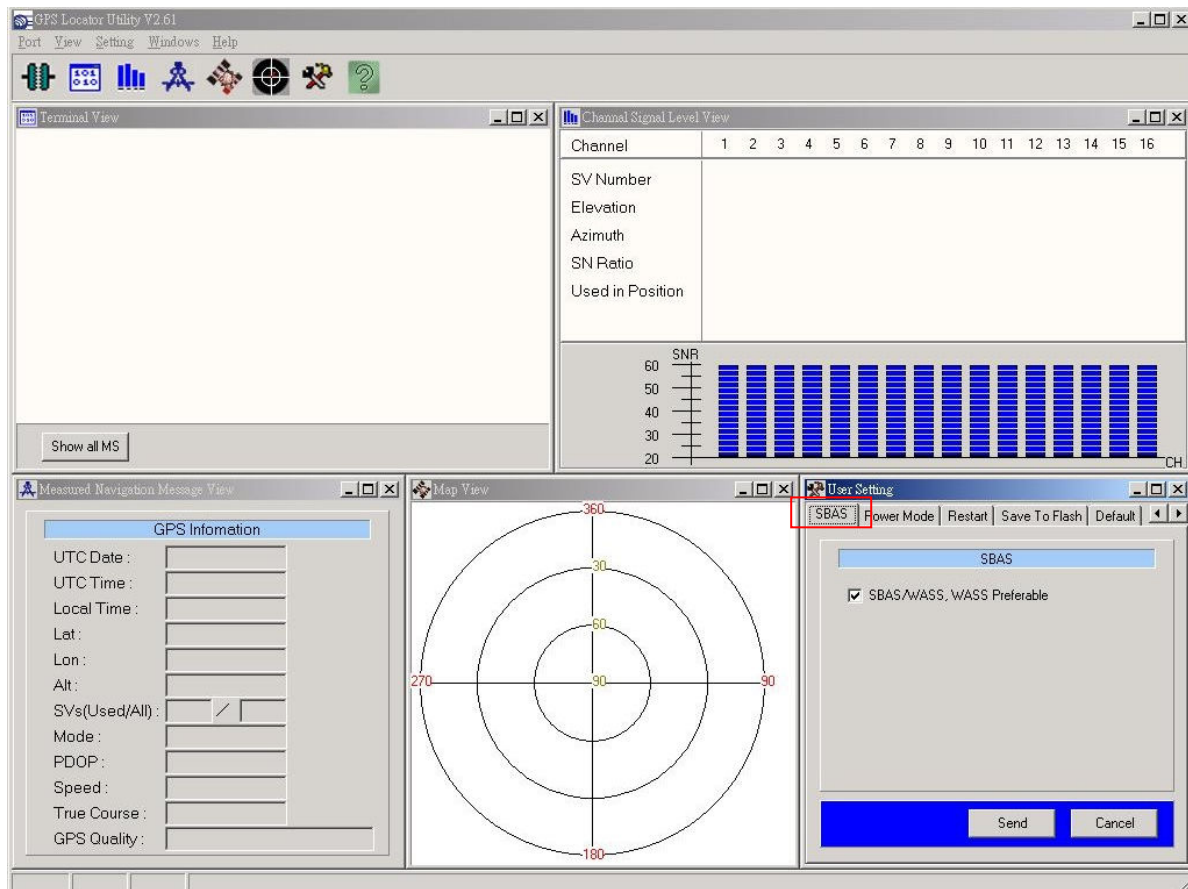
Note: After finishing local time zone setting, click "Send" to confirm the setting before proceeding next tap window for the other setting.

Note: After finishing all the setting(s), please tap to "Save to Flash" window. Tick "Save to Flash" and click on "Send" if the user would like to save the customized setting(s) into flash.



3.5 Functional Windows (SBAS Setting)

Enable/Disable the SBAS (WAAS).

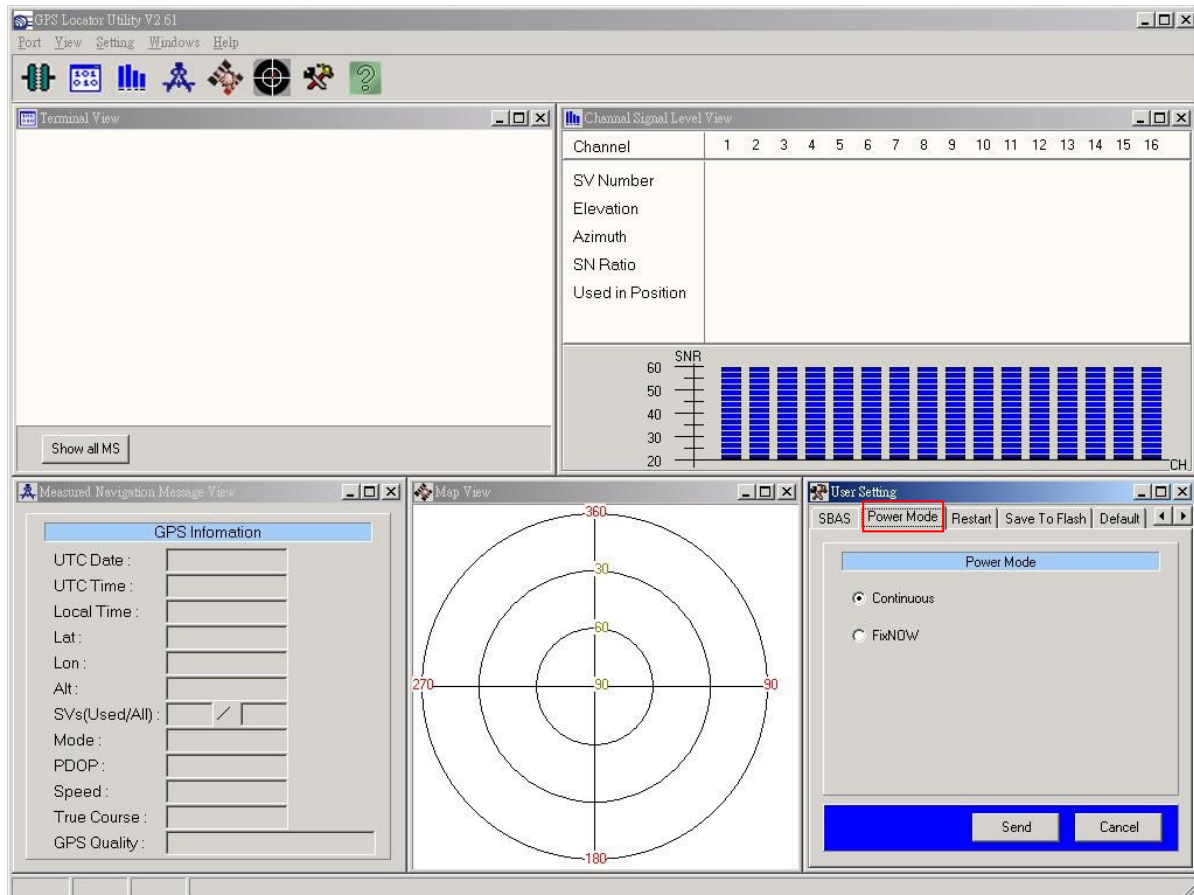


Note: After selecting the wanted SBAS setting, click "Send" to confirm the setting before proceeding next tap window for the other setting.

Note: After finishing all the setting(s), please tap to "Save to Flash" window. Tick "Save to Flash" and click on "Send" if the user would like to save the customized setting(s) into flash.

3.6 Functional Windows (Power Mode Setting)

Select the power mode and **“Continuous”** is preferred. Please contact ETEK for more information about the power mode.



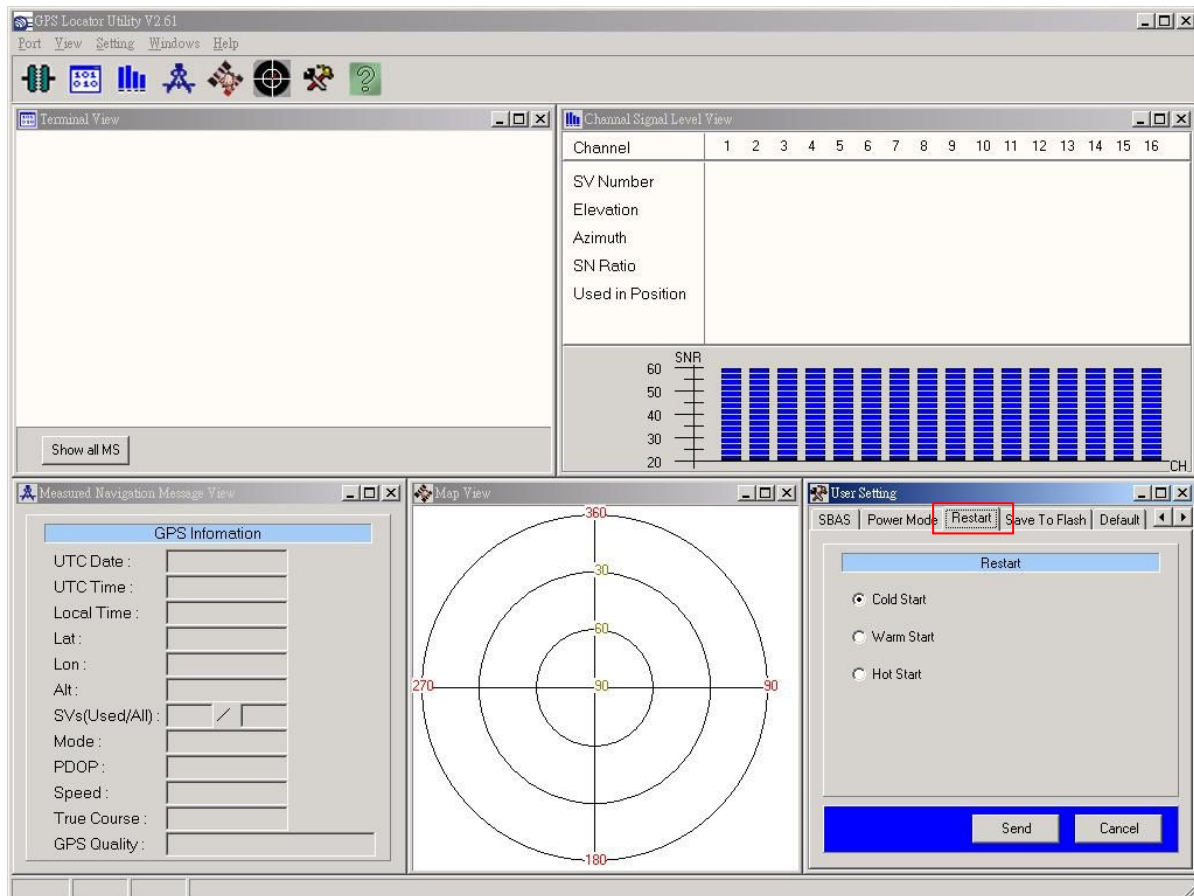
Note: After selecting the wanted power mode setting, click “Send” to confirm the setting before proceeding next tap window for the other setting.

Note: After finishing all the setting(s), please tap to “Save to Flash” window. Tick “Save to Flash” and click on “Send” if the user would like to save the customized setting(s) into flash.



3.7 Functional Windows (Restart Setting)

User can restart the unit by using this utility.



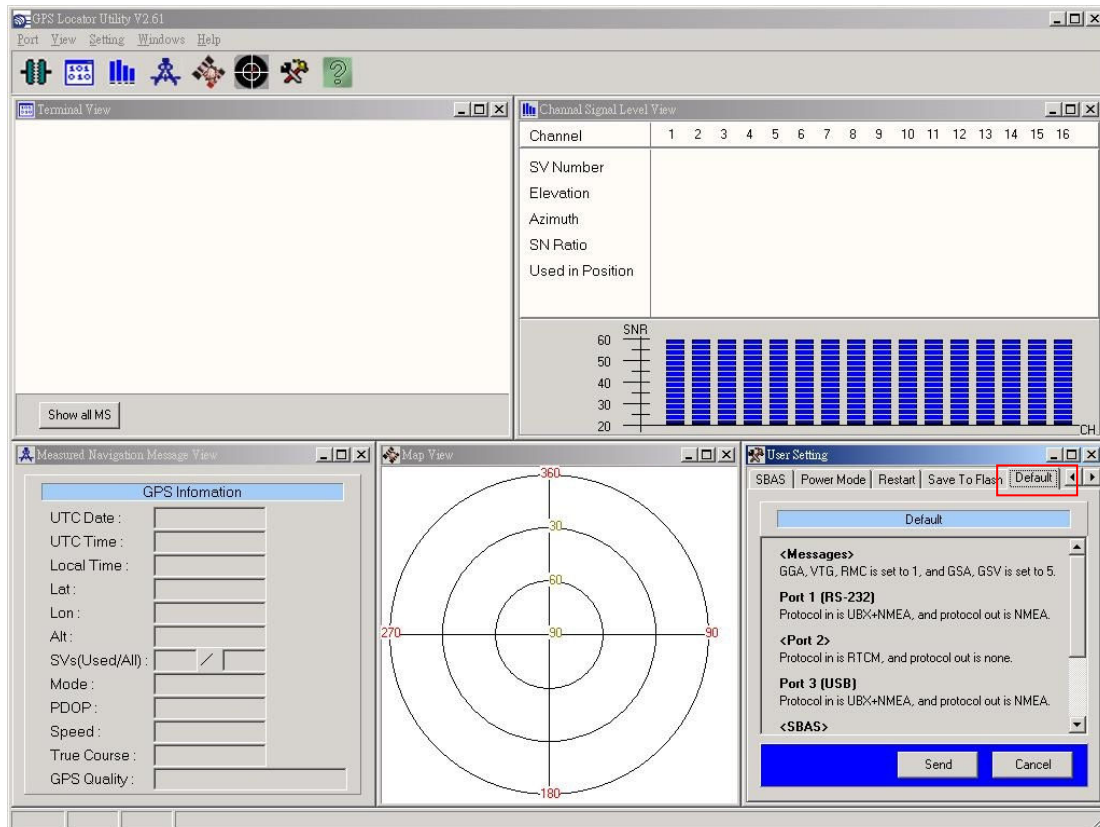
Note: After selecting the wanted restart setting, click "Send" to confirm the setting before proceeding next tap window for the other setting.

Note: After finishing all the setting(s), please tap to "Save to Flash" window. Tick "Save to Flash" and click on "Send" if the user would like to save the customized setting(s) into flash.



3.8 Functional Windows (View Default)

The default of receiver can be seen in this window.





Chapter 4 Applications

GM-88K can be used in meeting GPS navigational needs or Precise Time source, with a range of applicable fields as follows:

- Car Navigation.
- Fleet Management.
- Mileage Management.
- Tracking devices/system.
- Data logging for marine Navigation.
- Mapping devices for PC & Pocket PC.
- Marine Navigation or touring devices.
- AVL and Location-Based service system.



Chapter 5 Specification

| Specifications | Parameter | Description |
|-----------------------|---------------|---|
| General | | L1 frequency, C/A code(SPS), 32 Independent tracking channel |
| Sensitivity | | -158dBm |
| Accuracy | Position | Without aid: 3.3m CEP DGPS(RTCM): 2.6m |
| | Velocity | 0.1 Knot RMS steady state |
| Acquisition | Cold start | 41 sec. (typical) |
| | Warm start | 35 sec. (typical) |
| | Hot start | 1 sec. (typical) |
| Reacquisition | | 100 ms typical (signal reacquisition) |
| Dynamics | Altitude | 18000m max. |
| | Velocity | 500 m/sec. |
| | Vibration | 4G max. |
| Operation Temperature | | -30° C to +80° C |
| Storage Temperature | | -40° C to +85° C |
| Operating Humidity | | 0% to 95% RH, non condensing |
| Water Resistance | | 100% waterproof |
| Primary Power | | 8V ~ 35V DC |
| Power Consumption | | 34mA~44mA @ 12V DC |
| Protocol | | NMEA-0183 v3.01 baud rate(adjustable) 4800/9600/19200/38400/115200, default 4800 |
| Signal level | | RS-232(standard) |
| NMEA Message | Default | RMC, GGA, GSV*5, VTG, GSA*5 |
| | Optional | GLL, ZDA |
| | Update rate | 1~5Hz (Default, 1Hz) |
| DGPS Capability | | RTCM protocol |
| EMI filter | | Rejects power line interference |
| SBAS | | 1 channel (support WAAS, EGNOS, MSAS) |
| Power cable | | UL 2464/ 24AWG,15M |
| Enclosure | | High impact, corrosion-proof polycarbonate resin |
| Connector | | 7 pin circular, hermetically sealed. Gold plated for anti-corrosion |
| Dimensions | GPS Locator | 80mm(D) × 71.3 mm(H) |
| | Mounting Base | 110mm(W) × 70mm(L) × 75.2mm(H) |
| Weight | | 150 grams (without cable) |



Chapter 6 Troubleshooting

Case 1

No output

Suggested Solution:

Check whether the Com Port is enabled and whether you are using correct power supply.

Case 2

No activity or the Map Software is not receiving any GPS data.

Suggested Solution:

In our FREE GPS program the software automatically searches for Com 1 or Com 2 data as soon as the program is executed. Make sure that the **VP-88** is connected to Com 1 or Com 2.



ETEK NAVIGATION, INC.

PROFESSIONAL IN NAVIGATION & COMMUNICATION

Chapter 7 Limited Warranty

Thank you for your purchase of GPS product from ETEK Navigation, Inc.

ETEK Navigation, Inc. warrants this product to be free from defects in materials and workmanship for one year from the date of purchase. The warranty for accessories is six months. The stamp of distributor or a copy of the original sales receipt is required as the proof of purchase for warranty repairs. ETEK Navigation, Inc. will, at its sole option, repair or replace any components, which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is, however, responsible for any transportation costs.

This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration of repairs. ETEK assumes no responsibility for special, incidental, punitive or consequential damages, or loss of use.

PURCHASER DUTIES

The purchaser must return defective unit postpaid, with the proof of original purchase and a return address to:

ETEK NAVIGATION, INC.

10F, No.105, Xicheng Rd., Banqiao City,

Taipei County 220, Taiwan (R.O.C.).

Tel: 886-2-26860199

Fax: 886-2-26866159

<http://www.etek.com>

Technical Support: etek@etek.com.tw



Chapter 8 Available NMEA Messages

8.1 NMEA Protocol

The NMEA protocol expresses the data in the format of ASCII. This is a standard format for GPS applications.

8.1.1 Standard NMEA Messages

The module can output 7 standard NMEA messages, which are

NMEA Output Messages

| NMEA Record | Description |
|--------------------|--|
| GGA | Global Positioning System Fix Data. |
| GSA | GNSS DOP and Active Satellites |
| GSV | GNSS Satellites in View |
| RMC | Recommended Minimum Navigation Information |
| VTG | Course Over Ground and Ground Speed |
| GLL | Geographic Position – Latitude / Longitude |
| ZDA | Time & Date |

Those messages are output at TX1 at the rate of 4800 bps (default setting). When more than 4 messages are chosen, a higher baud rate than 4800 bps is required.

The following will summarize the available NMEA messages. More information about the NMEA messages refers to "NMEA 0183, Standard for Interfacing Marine Electronic Devices, Version 3.01.



8.2 GGA – GPS Fix Data

Position fix related data, such as position, time, number of satellites in use, etc.

**\$GPGGA,gga1,gga2,gga3,gga4,gga5,gga6,gga7,gga8,gga9,gga10,
gga11,gga12,gga13,gga14*hh<CR><LF>**

| Parameters | Descriptions | Notes |
|-------------------|---|--|
| gga1 | UTC time as position is fixed | hhmmss.sss: hh – hour; mm – minute; ss.sss – second |
| gga2 | Latitude | ddmm.mmmmmm: dd – degree; mm.mmmmmm – minute (0° ~ 90°) |
| gga3 | Latitude sector | N – North; S – South |
| gga4 | Longitude | dddmm.mmmmmm: dd – degree; mm.mmmmmm – minute (0° ~ 180°) |
| gga5 | Longitude sector | E – East; W – West |
| gga6 | GPS quality indicator | 0 – No fixed or invalid position 1 – SPS Position available 2 – Differential GPS (SPS) |
| gga7 | Number of SVs used in position estimation | xx: 00 ~ 12 |
| gga8 | HDOP | xx.xx: 00.00 ~ 99.99 |
| gga9 | Altitude above mean sea level (geoid) | xx.xxx: 00.000 ~ 99.999 |
| gga10 | Unit for Altitude | M: meter |
| gga11 | Geoidal separation | |
| gga12 | Unit for geoidal separation | M: meter |
| gga13 | Age of differential corrections | unit : second; null when DGPS is not used |
| gga14 | Reference station ID (DGPS) | xxxx: 0000 ~ 1023 |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |



8.3 GLL – Geographic Position – Latitude/Longitude

Navigation data and status.

\$GPGLL,gll1,gll2,gll3,gll4,gll5,gll6,gll7*hh<CR><LF>

| Parameters | Descriptions | Notes |
|-------------------|-------------------------------|--|
| gll1 | Latitude | ddmm.mmmmmm: dd – degree; mm.mmmmmm – minute (0° ~ 90°) |
| gll2 | Latitude sector | N – North; S – South |
| gll3 | Longitude | dddmm.mmmmmm: dd – degree; mm.mmmmmm – minute (0° ~ 180°) |
| gll4 | Longitude sector | E – East; W – West |
| gll5 | UTC time as position is fixed | hhmmss.ss: hh – hour; mm – minute; ss.ss – second |
| gll6 | Status for position fix | A – Valid; V – Invalid |
| gll7 | Navigation mode indicator | A – Autonomous mode (fix); D – Differential mode (fix); E – DR (fix); N – not valid |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |



8.4 GSA – GNSS DOP and Active Satellites

Receiver operating mode, the values of DOPs, and PRN numbers for satellites used in the GGA position solution.

\$GPGSA,gsa1,gsa2,(gsa3*12),gsa4,gsa5,gsa6*hh<CR><LF>

| Parameters | Descriptions | Notes |
|------------|---|--|
| gsa1 | Selection Mode | |
| gsa2 | Mode for position fix | 1 – fix not available; 2 – 2D; 3 – 3D; |
| gsa3*12 | PRN numbers for satellites used in the position solution. There will be 12 available fields for PRN numbers. If number of satellites is less than 12, the remaining fields will be left as empty fields. If number of satellites is greater than 12, only the values of the first 12 satellites will be output. | xx |
| gsa4 | PDOP | 0 ~ 99.99 in meters |
| gsa5 | HDOP | 0 ~ 99.99 in meters |
| gsa6 | VDOP | 0 ~ 99.99 in meters |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |



8.5 GSV – GNSS Satellites in View

This message indicates the observable satellites' information, such as PRN numbers, elevation, azimuth, SNR, and number of satellites in view.

\$GPGSV,gsv1,gsv2,gsv3,((gsv4,gsv5,gsv6,gsv7)*n)*hh<CR><LF>

| Parameters | Descriptions | Notes |
|------------|------------------------------------|--------------------------------------|
| gsv1 | Total number of messages | 1 ~ 9 |
| gsv2 | Message number | 1 ~ 9 |
| gsv3 | Total number of satellites in view | xx |
| gsv4 | PRN number | xx |
| gsv5 | Elevation (degrees) | 90° maximum |
| gsv6 | Azimuth (degrees) | 0° ~ 360° |
| gsv7 | SNR (C/N ₀) | 0 ~ 99 dB-Hz, null when not tracking |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |

The message can carry at most four (gsv4,gsv5,gsv6,gsv7) sets of observable satellites. For a less than four-set case, the message only transmits available sets and the rest of them will not be output, i.e., the message doesn't transmit empty fields.



8.6 RMC – Recommended Minimum Specific GNSS Data

This message transmits the necessary navigation data, such as time, position, speed, course, and so on.

\$GPRMC,rmc1,rmc2,rmc3,rmc4,rmc5,rmc6,rmc7,rmc8,rmc9,rmc10,rmc11,rmc12*hh<CR><LF>

| Parameters | Descriptions | Notes |
|-------------------|---------------------------------|--|
| rmc1 | UTC time as position is fixed | hhmmss.sss: hh – hour; mm – minute; ss.sss – second |
| rmc2 | Status of position fix | A – data valid, which includes the scenarios of 2D, 3D, and DR. V – navigation receiver warning |
| rmc3 | Latitude | ddmm.mmmmmm: dd – degree; mm.mmmmmm – minute (0° ~ 90°) |
| rmc4 | Latitude sector | N – North; S – South |
| rmc5 | Longitude | dddmm.mmmmmm: ddd – degree; mm.mmmmmm – minute (0° ~ 180°) |
| rmc6 | Longitude sector | E- East; W- West |
| rmc7 | Speed over ground (SOG) | x.xxx knots |
| rmc8 | Course over ground (COG) | Referenced to true north (xx.xx degrees) |
| rmc9 | UTC Date | ddmmyy: dd – day; mm – month; yy – year |
| rmc10 | Magnetic variation | Not supported |
| rmc11 | Direction of magnetic variation | Not supported |
| rmc12 | Navigation mode indicator | A – Autonomous mode (fix); D – Differential mode (fix); E – DR (fix); N – not valid |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |

**8.7 VTG – Course over Ground and Ground Speed**

This message transmits the speed and course relative to ground.

\$GPVTG,vtg1,vtg2,vtg3,vtg4,vtg5,vtg6,vtg7,vtg8,vtg9*hh<CR><LF>

| Parameters | Descriptions | Notes |
|------------|-------------------------------|--|
| vtg1 | Course over ground (degrees) | Referenced to true north (xx.xx°) |
| vtg2 | Indicator of course reference | T – true north |
| vtg3 | Course over ground (degrees) | Not Support |
| vtg4 | Indicator of course reference | M – magnetic north |
| vtg5 | Speed over ground | x.xxx knots |
| vtg6 | Unit of speed | N – nautical miles per hour |
| vtg7 | Speed over ground | x.xxx km/hr |
| vtg8 | Unit of speed | K – kilometers per hour |
| vtg9 | Navigation mode indicator | A – Autonomous mode (fix); D – Differential mode (fix); E – DR (fix); N – not valid |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |

**8.8 ZDA – Time & Date**

This message transmits UTC time and date, and local time zone.

\$GPZDA,zda1,zda2,zda3,zda4,zda5,zda6*hh<CR><LF>

| Parameters | Descriptions | Notes |
|-------------------|---------------------|---|
| zda1 | UTC time | hhmmss.sss: hh – hour; mm – minute; ss.sss – second |
| zda2 | UTC day | 01 ~ 31 |
| zda3 | UTC month | 01 ~ 12 |
| zda4 | UTC year | xxxx (4 digits) |
| zda5 | Local zone hours | 00 to \pm 13 hours |
| zda6 | Local zone minutes | 00 to \pm 60 minutes |
| hh | Checksum | hex number (2 – character) |
| <CR><LF> | End of message | |